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GB 1485113 A GB 0638493 A GB 0408406 A
GB 0356539 A GB 0326457 A

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(54) Abstract Title
Slide projector

(57) A slide projector comprises means in which to project an image vertically from a slide onto a projection surface. In use the projected image of the slide lies in a substantially horizontal planar surface. The slide 19 may be located in a rotating carousel 23 which can be automatically, or manually, rotated, thus providing accurate simulation of the orientation of stars and other celestial bodies at a specific date and time. At least two vertically juxtaposed slides 19,20, parallel to one another in the horizontal plane may be present. One of these slides 21 may be fixed and may display an image of a night horizon. A planetarium projector is shown as is cooling fan 53.

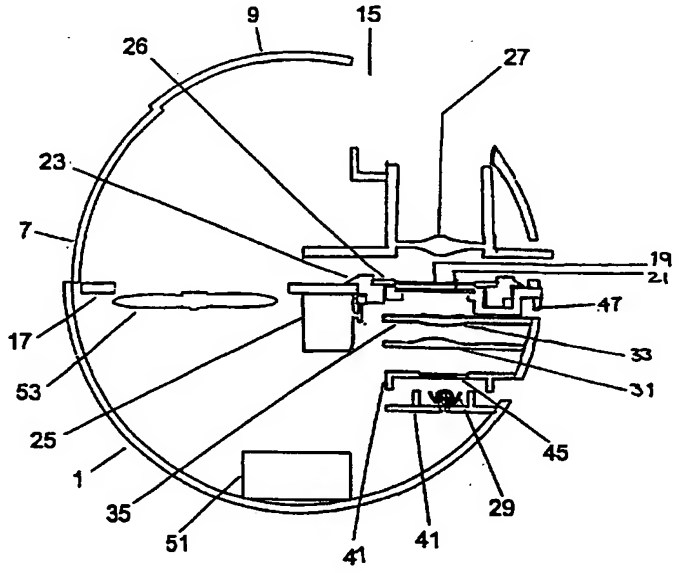

Figure 4

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At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

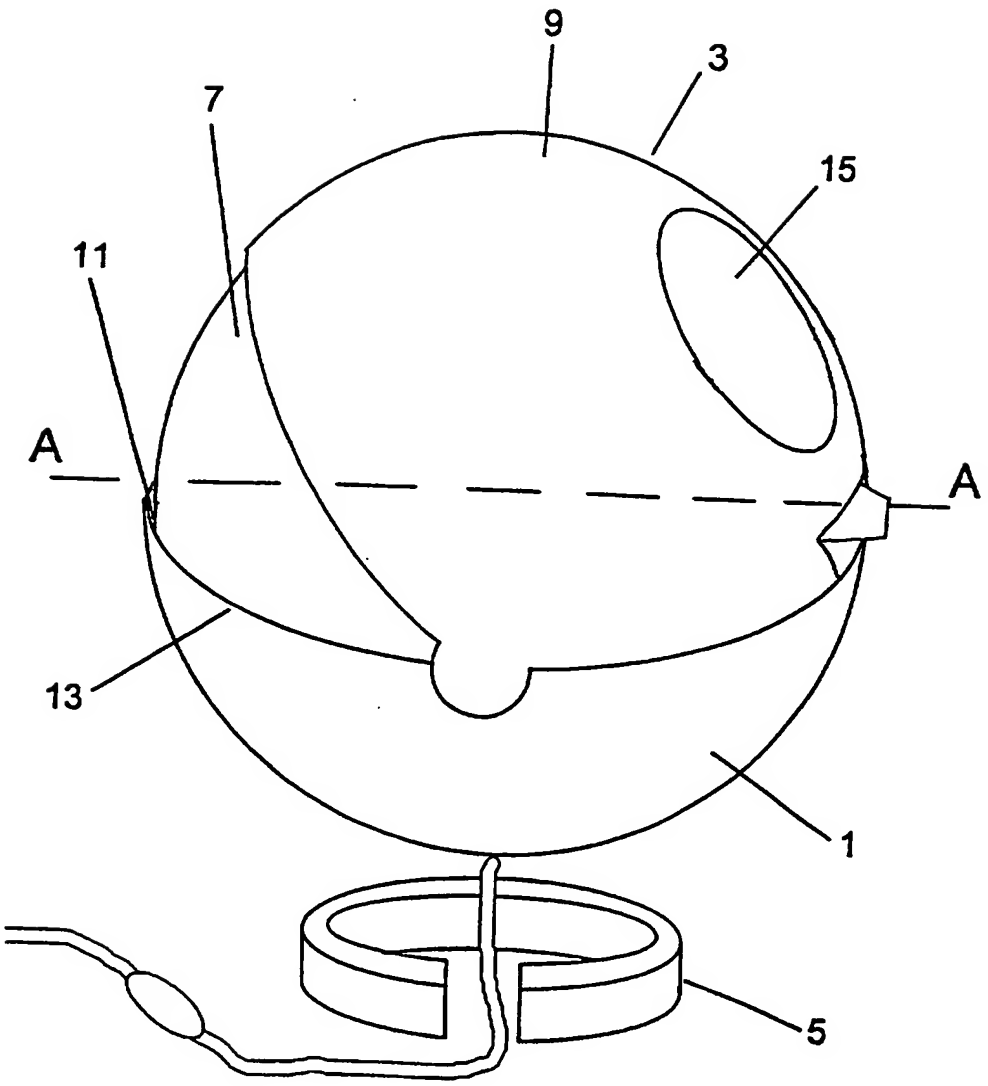

Figure 1

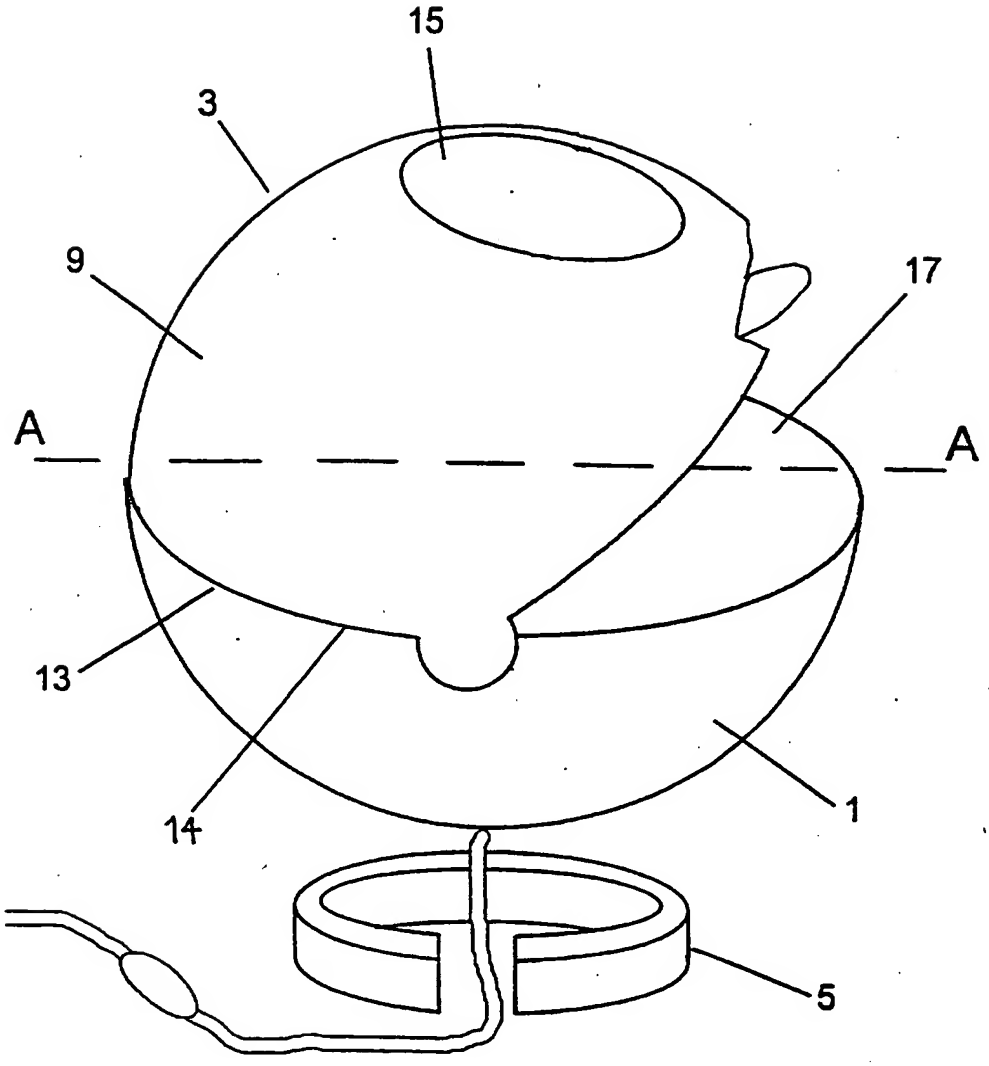

Figure 2

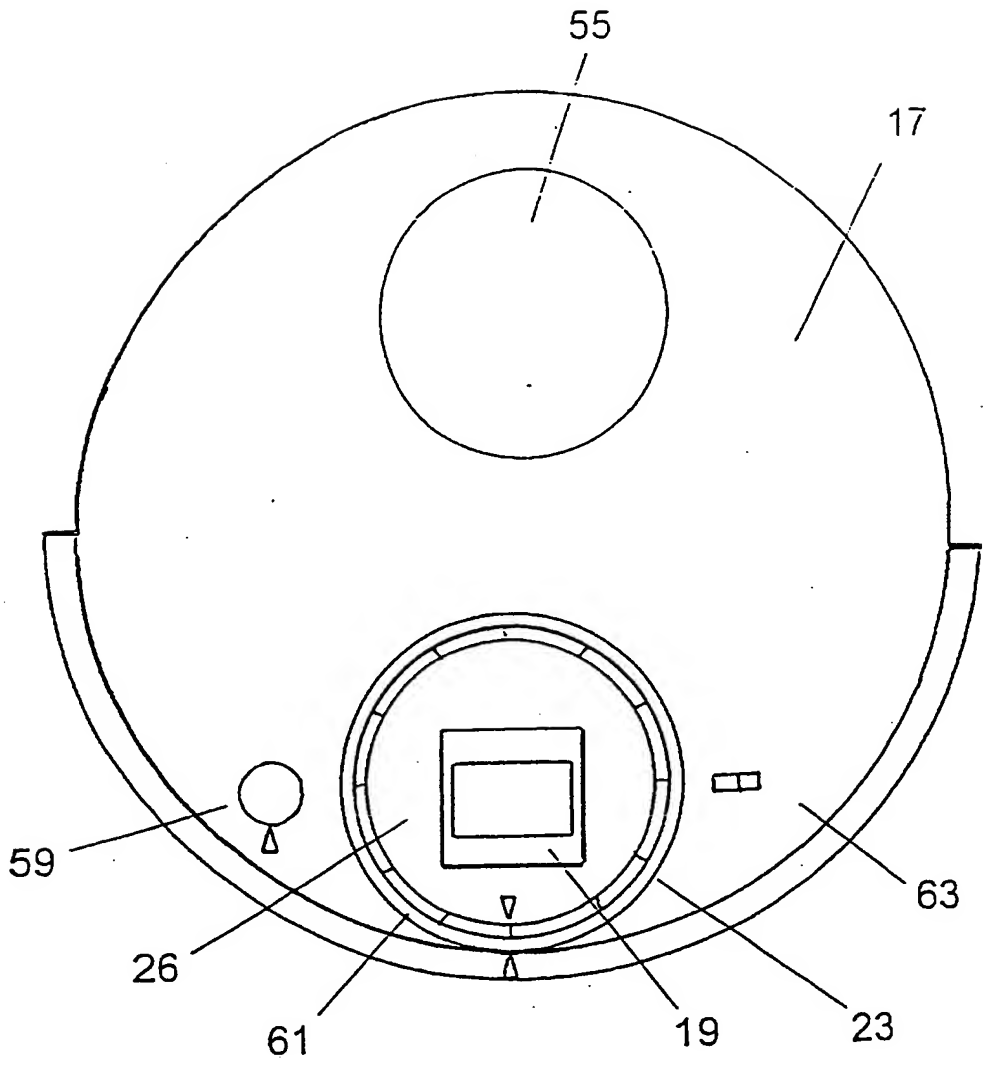

Figure 3

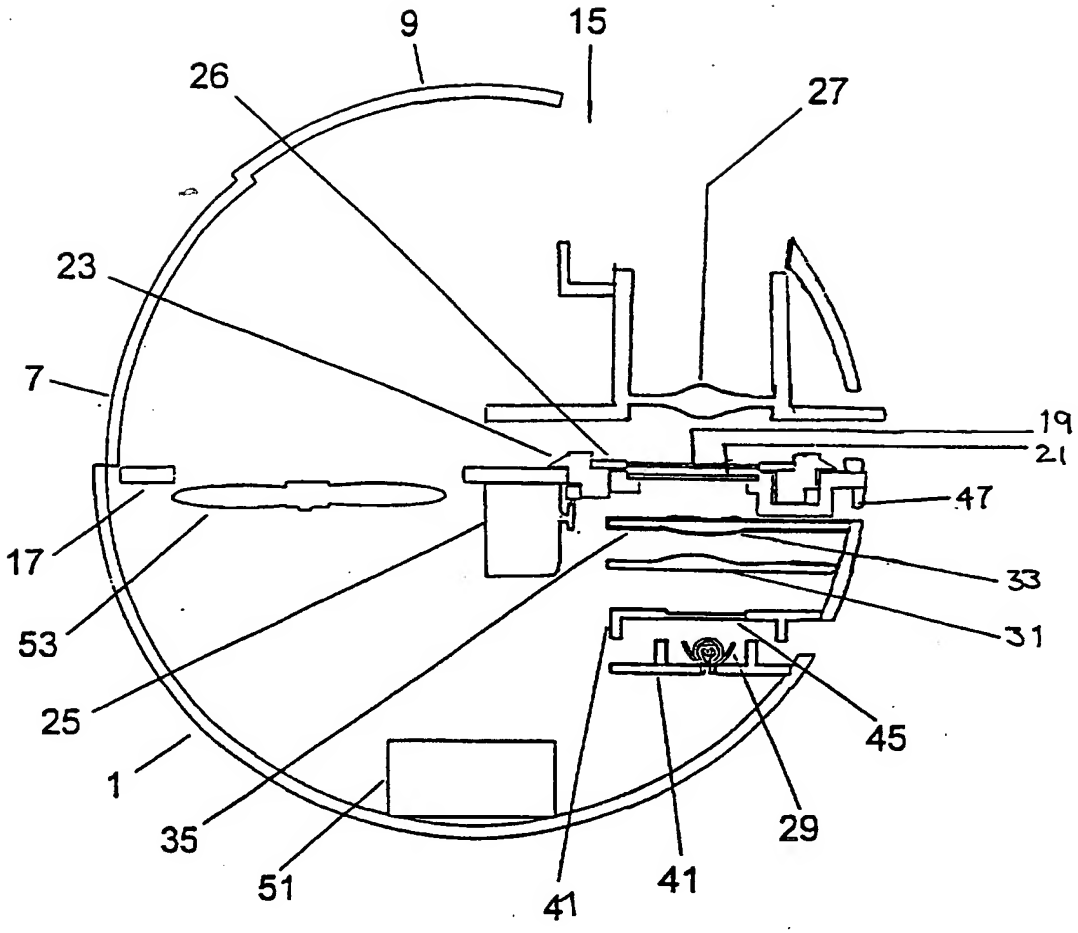

Figure 4

A Slide Projector

The present invention relates to a slide projector, and more specifically to a portable planetarium projector for use in the home.

On the eve of the Millennium, there is an increased interest in the scientific study of astronomy, and also in astrology. Many people visit exhibitions and shows which demonstrate, in simple terms, the movements of stars and other celestial bodies during an hour, day, month or year. Such demonstrations are usually held in large areas and in front of large audiences, due to the complexity and cost of the planetarium required in order to demonstrate the astronomy as accurately as possible.

Planetariums have, by dictionary definition, projectors that project the positions and movements of stars and planets on to a hemispherical domed ceiling in order to simulate the night sky to an audience seated below. Although this definition stipulates a the presence of a hemispherical domed ceiling, a planetarium, for the purposes of this specification should be interpreted to include a substantially planar display surface.

Hereto, all mechanical planetarium projectors use spherical or hemispherical surfaces on which a star field representation is held before being projected onto a dome shaped surface. A computer-based planetarium projector is known, which has a star field projected from a flat computer screen, for example in UK Patent No. 2050775. The software is, however, written for the projection of the star field image onto a domed surface.

The problem with all current planetarium projectors is that purpose-built domed auditoria must be built in order to accurately display the night sky, with the all the celestial bodies in their correct orientations and positions.

Temporary domed structures, such as large inflatable domes, of about 12 to 14 feet diameter, can be filled with air to demonstrate astronomy, although experts are required to run the demonstration, and the costs can be as large as £10,000. Such planetariums are more suitable for hiring by schools to demonstrate simple astronomy to their pupils.

A children's toy is currently available that comprises a bulb within a transparent ball that may provide some sort of night sky display, when projected on to an outside surface. This is very much limited to being a toy, however, and does not provide an accurate projection for the purposes of studying astronomy.

Conventional planetarium projectors comprise a spherical body located around a central light source. The spherical body has an array of pinholes in its surface, through which light is projected from the internal light source. The pinholes do not have any lens assembly. This leads to a projection of dim and fuzzy star, and celestial body, representations.

Furthermore, conventional planetarium projectors require a great deal of skill and training to be operated effectively.

There are currently no accurate planetarium projectors available that are suitable for use by an individual in the home, due to the size, complexity and cost of planetarium projectors, and the requirement for a large domed surface on which to project the star field.

The present invention seeks to alleviate the aforementioned disadvantages by providing a slide projector that is portable, easy to use, of reasonable cost, and is suitable for use by an individual, or individuals, in the home. In particular, the present invention eliminates the necessity for a domed surface on which to project the night sky in the case of planetarium projector.

Accordingly, there is provided a slide projector comprising projection means for directly projecting an image from a slide vertically onto a projection surface, the

projection means being such that the projected image of the slide lies, in use, in a substantially horizontal planar projection surface.

In a preferred embodiment, the slide projector comprises two vertically juxtaposed slides, parallel to one another in the horizontal plane.

Preferably, one of the slides may be rotatable while the other slide remains in a fixed position. Alternatively, both slides may be rotatable or both slides may remain in fixed positions.

The slide projector may also have means for retaining the slides in a set position, preferably by providing an air flow above and below the slides. Preferably, the slides are retained due to a sub-atmospheric pressure that is formed below the slides.

Preferably, the slide will display images of astronomy such as starfields and other celestial bodies

Preferably still, the fixed slide is one that, in use, displays an image of an Eastern or Western horizon. The rotatable slide is preferably one that, in use, displays the image of night sky showing a starfield and/or various other celestial bodies.

A planetarium projector constructed in accordance with the present invention will now be described in detail, by way of example, with reference to the accompanying drawings, in which :

Figure 1 is a perspective view of the planetarium projector, when in its closed position;
Figure 2 is a perspective view of the planetarium projector, when in its open position;
Figure 3 is cross sectional view taken through A-A of Figures 1 or 2; and
Figure 4 is a diagrammatic representation showing the internal components of the planetarium projector of Figures 1 to 3.

Referring to Figure 1, the planetarium projector comprises a hollow hemispherical lower portion 1 and a hollow hemispherical upper portion 3. Preferably, the portions are made from plastics material. The lower portion 1 is mounted on a base 5, in the form of a ring, which is able to receive the lower portion, such that the lower portion can be positioned stably thereon and is able to be oriented through a limited angle range. The lower portion 1 may be provided with several indentations with which to receive the upper edge portion of the base 5, to achieve better stability.

The upper portion is formed in first and second hemispherical parts 7 and 9. The first part 7 is fixedly attached to the inner wall of the second part 9 and protrudes downwards therefrom. The upper hemispherical portion 3 is pivotally mounted on the lower portion 1 such that the first part is slidable within the lower portion.

The upper portion 3, therefore, can be retained in an open position, as shown in Figure 2, wherein the first part 7 of the upper portion is slid into the lower hemispherical portion 1 such that a bottom rim 14 of the second part 9 abuts an upper rim 13 of the lower portion 1. When the upper portion 3 is in its opened position, the internal components within the planetarium projector are easily accessible.

Alternatively, the upper portion 3 can be retained in a closed position, as shown in Figure 1, wherein the first part 7 of the upper portion 3 is not slid into the lower portion 1 such that the two parts 7, 9 form a hemisphere, mounted over, and covering the lower hemispherical portion 1. At this point, the rim 11 of the first part 7 abuts the upper rim 13 of the lower portion.

In an alternative embodiment (not shown), the upper portion is formed in first and second parts. The first part 7 is fixedly attached to an inner wall of one side of the lower portion 1 and protrudes upwards therefrom. The second part 9, forming a substantial part of the entire hemispherical upper portion 3, is pivotally mounted on the lower portion 1 so as to slidable over the first part 7. The upper portion 3 has a large aperture 15 through which light can be transmitted from a light source within the planetarium,

and images can be subsequently projected on a surface. The lower and upper portions 1, 3 of the planetarium are attached together to form a hollow sphere.

The components of the projector are all located within the hollow sphere planetarium projector. Referring to Figure 4, a plastics base plate 17, having a diameter substantially equal to that of the lower hemispherical portion 1, is fixedly attached to the top of the hemispherical portion 1. Thus, the base plate 17 divides the upper and lower hemispherical portions 1, 3. A rubber air seal 14 is provided between the base plate 17 and the upper hemispherical portion 3, at its pivotal point with the lower hemispherical portion 1.

Referring to Figures 3 and 4, the base plate 17 has, mounted thereon, means for mounting two vertically juxtaposed transparent slides 19, 21. The mountings include, a rotating carousel 23, on which the top slide 19 is positioned. The rotating carousel 23 is driven by a motor, such as a quartz clock mechanism 25. The bottom slide 21 rests in an indentation formed in the base plate The bottom slide 21 is not rotatable. The carousel 23 rests on a wider indentation in the base plate 17. A rotatable mounting 26 is located within the carousel. The rotatable mounting holds the top slide 19. A wide angle projecting lens 27 is mounted above the top slide 19.

The bottom slide 21, that is fixed, displays an image of the Eastern or Western horizon. The top slide 19, that is rotatable, can be routinely changed and can display, for example, an unannotated night sky or an annotated night sky showing northern or southern hemisphere starfields, planets and other celestial bodies associated therewith or solar systems and celestial bodies associated therewith.

A light source, in the form of a standard low energy halogen reflector bulb 29, is located beneath the bottom slide 21. Primary and secondary condensing lenses 31, 33 respectively, are located between the bulb 29 and the bottom slide 21 so as to condense and intensify the light emitted to the bottom slide. The primary and secondary condensing lenses 31, 33 are fixed to plastics support plates 35, 37. The support plates 35, 37 are attached to the base plate 17. The support plate 37 additionally functions as a

ventilation baffle to provide thorough ventilation to both the bottom slide 21 and the condensing lens 33. An aperture 54 is provided in the lower hemisphere portion 1. The aperture 54 forms an air inlet to provide air flow underneath the bottom slide 21, so as to keep the bottom slide sufficiently cool.

The light source 29 is fixed to a support plate 41, made of a metallic material which is able to withstand high levels of heat, such as tin, for example. The support plate 41 is coated with non-flammable black paint. A further support plate 43, with a heat filter 45 attached thereto, is provided above the light bulb support plate 41. The support plates 41, 43 are attached to the base plate 17. The heat filter 45 is positioned directly above the light bulb 29 to reduce the intensity of the heat transmitted from the light bulb to the condensing lenses 31, 33. An aperture 47 is provided in the lower hemispherical portion 1 between the two support plates 41, 43, and forms an air inlet to provide air flow over the light bulb 29 in order to carry away heat emitted from it. The support plates 41, 43 additionally function as ventilation baffles. A micro-switch 49 is provided in order to operate the light bulb 29. By this means, the light bulb is only lit when the upper hemisphere portion is in its closed position.

The projecting lens 27 is located within a mount 28 adjustably engaged to the upper hemispherical portion 3, and protruding inwardly therefrom. The projecting lens 27 is positioned directly below the aperture 15, such that images on the transparent slides 19, 21 can be emitted through the aperture and onto a display surface (not shown). The exterior of the projecting lens mount 28 has a screw thread which engages with a horizontal aperture 52 in the upper hemisphere portion. The projector operator is able to rotate the lens mount 28 to move the lens 27 vertically in order to achieve focusing of the image on the projection surface.

A power supply 51, within the projector sphere, provides low voltage to the light bulb 29 and the fan 53, from a mains supply. The power supply 51 additionally provides ballast weight to keep the hollow sphere stable and upright on the base ring 5. One or more cooling fans 53 are provided within the planetarium sphere in order to keep the components within the sphere sufficiently cool. An exhaust ventilation hole 55 is

provided in the surface of the upper portion 3, which allows the warmed air to exit the sphere. The ventilation fan(s) causes negative air pressure to develop in the lower hemispherical portion 1. This, in turn, causes the higher air pressure, formed in the upper hemispherical portion 3, to push down on the slides 19 and 21. The resultant force firmly seats the slides 19, 21 in their respective positions, and prevents them from moving vertically, thus avoiding the re-focusing operations usually necessary with conventional slide projectors.

Referring back to Figure 4, the base plate 17 has a ball compass 59 formed integral therewith. This allows the projector to be correctly aligned with magnetic north, such that the projected night sky can accurately reflect the orientation of the stars for the current date and time. The rotating carousel 23 is circular and has, circumventing its perimeter, a time dial 61. In use, the top slide 19, rests in a mount 26 that rotates within the carousel 23 and is initially aligned to the correct date using the time dial 61. The time dial 61 is then aligned, together with the slide mount 26, to the correct time with the aid of an arrow marking on the base plate 17. Once positioned correctly, the top slide 19 rotates together with the carousel 23 at a predetermined speed, set by a carousel speed selector switch 63 formed integral with the base plate 17. As the top slide 19 rotates, above the fixed bottom slide 21, varying images will be emitted from the slides and on to a planar surface (not shown).

A fan exhaust hole 65 is also provided in the base plate 17 to allow the expulsion of warmed air by the fan.

An audio tape may also be provided to provide narration as the planetarium is in operation.

Due to the nature of the invention, models of varying complexity can be envisaged for different applications. Two examples of such models are detailed below.

A "Junior" model has been produced, having a reduced number of components resulting in reduced price and function. Such a model may be suitable as a child's toy or

for soothing illumination of a ceiling of a room in the home. The images of stars and the like, projected onto a ceiling may also be used as a stencil for correctly placing phosphorescent glow-in-the-dark stars available from toy shops. The model is, preferably, battery powered with a low-wattage lamp. The lenses are preferably made from plastics material. The model does not require a motor or gearing (although the carousel and slide mount will still be rotatable manually) or a ventilation fan.

A "Professional" model has also been constructed which is intended to be used by teachers, and people putting on shows for larger audiences. The control mechanisms of the model are, preferably, operated from buttons exterior to the main planetarium structure by a remote control unit. A relay box in the control unit has a plurality of relays, each being operatively associated with a button to actuate a planetarium mechanism. The carousel also has additional speed settings (for example two minute full rotation) and gearing to rotate the carousel 23 in both directions. Carousel speeds may be selected from the remote control unit. Preferably, the model also has the facility for the operator to remotely change slides. In this case, a plurality of rotating carousels may be provided on the base plate. The base plate may rotate around a central pivot, thereby brining each carousel, in turn, into the path of the projected light.

Furthermore, the Professional model, preferably, includes the facility for inaudible ultrasound pulses recorded in an audio program designed to run concurrently with the planetarium to automatically operate the controls of the planetarium.

Although the specific description relates to a planetarium projector, it is clearly envisaged that the invention can be incorporated into any slide projector presentation to show, for example, movements of various items in relation to a fixed horizon or background.

Claims

1. A slide projector comprising projection means for directly projecting an image from a slide vertically onto a projection surface, the projection means being such that the projected image of the slide lies, in use, in a substantially horizontal planar projection surface.

2. A slide projector according to claim 1, wherein the projection means comprises a light source and at least two vertically juxtaposed slides, parallel to one another in the horizontal plane.

3. A slide projector according to claim 2, wherein the projector means comprises rotation means for rotating at least one of the slides.

4. A slide projector according to claim 3, wherein the rotation means is in the form of a rotatable carousel.

5. A slide projector according to claim 3, wherein the rotatable carousel is able to rotate the slide at a predetermined speed.

6. A slide projector according any one of claims 2 to 5, wherein the projection means further comprises mounting means for holding at least one of the slides in a fixed position.

7. A slide projector according to claim 6 , wherein the fixed slide is positioned directly below the rotatable slide.

8. A slide projector according to claim 7, wherein the projection means further comprises means for retaining the slides on the carousel and the mounting means respectively, and for keeping the slides in close contact therewith.

9. A slide projector according to claim 8, wherein the retaining means comprises the provision of an air flow above and below the slides.

10. A slide projector according to claim 9, wherein the air flow provides a sub-atmospheric pressure below the slides, thereby retaining them in their respective position.

11. A planetarium having a slide projector constructed in accordance with any of the preceding claims.

12. A planetarium according to claim 11, wherein the fixed slide is such as to display, in use, an image of a night horizon.

13. A planetarium according to claim 11 or claim 12, wherein the rotatable slide is such as to display, in use, an image of a starfield.

14. A planetarium according to claim 11 or claim 12, wherein the rotatable slide is such as to display, in use, an image of a planet and any celestial bodies associated therewith.

5. A planetarium according to claim 11 or claim 12, wherein the rotatable slide is such as to display, in use, an image of a solar system and any celestial bodies associated therewith.

16. A slide projector as substantially hereinbefore described and illustrated by the accompanying Figures.

17. A planetarium as substantially hereinbefore described and illustrated by the accompanying Figures.

The Patent Office

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Application No: GB 9923646.5
Claims searched: 1-17

Examiner: Meredith Reynolds
Date of search: 10 February 2000

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.R): G2J (J41, J41U, J41W), A6S (S22X)

Int Cl (Ed.7): G03B 21/00, G09B 27/00, A63H 33/22

Other:

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X	GB 1485113	(Atkinson)(Fig 2)	1
X	GB 0638493	(Cordonnier)(Fig)	1
X	GB 0408406	(Matthews)(Fig)	1
X	GB 0356539	(Isebarn)(Figs, p 2 lines 23-31)	1
X	GB 0326457	(Bergye)(Fig)	1

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.